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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

MAILED
APR 18 2007
GROUP 1700

Application Number: 10/024,869
Filing Date: December 19, 2001
Appellant(s): ZIMMER ET AL.

Richard B. O'Planick
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12-21-06 appealing from the Office action mailed 12-30-05.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellants' statement of the status of amendments after final rejection contained in the brief is substantially correct. The correct status of amendments after final rejection is as follows: A response after final rejection was filed on 3-31-06, which presented only arguments. No amendment was made in the response after final rejection filed 3-31-06. In the advisory action dated 4-27-06, examiner proposed changes to place the application in condition for allowance. No amendment after final rejection incorporating the examiner's proposed changes has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellants' statement of the grounds of rejection to be reviewed on appeal is substantially correct. The correct statement of the grounds of rejection to be reviewed on appeal are presented below:

I. Claims 1, 2, 5-9, 14-15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drews 302 (US 4284302) in view of Fronek et al (US 5848769) and optionally Drews 290 (US 4180290).

II Claims 15, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drews 302 in view of Fronek et al and optionally Drews 290 as applied above and further in view of Kemp et al (US 6253815).

III Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Drews 302 in view of Fronek et al and optionally Drews 290 as applied above and further in view of Japan 219 (JP 6-40219) or Baker (US 5603796).

IV. Claims 1-16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa (US 2001/0032691) in view of at least one of Lobert et al (US 4750693) and Drews 302.

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner:

(1) The rejection of claim 3 under 35 U.S.C. 103(a) as being unpatentable over Drews 302 in view of Fronek et al and optionally Drews 290 as applied above and further in view of Rethorst (US 3523661) has been withdrawn.

(2) The rejection of claim 4 under 35 U.S.C. 103(a) as being unpatentable over Drews 302 in view of Fronek et al and optionally Drews 290 has been withdrawn.

(3) The rejection of claims 10-13, 16 and 18 under 35 U.S.C. 103(a) as being unpatentable over Drews 302 in view of Fronek et al and optionally Drews 290 as applied above and further in view of Heinen (GB 2363100 or US 6415835) or Ohsawa (US 2001/0032691) have been withdrawn.

(4) The references Drews 290 and Japan 135 have been withdrawn from the 103 rejection of claims 1-16 and 18 using Ohsawa as a primary reference.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon[1]

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

4,284,302	Drews 302	08-1981
5,848,769	Fronek et al	12-1998
4,180,290	Drews 290	12-1979
2001/0032691	Ohsawa	10-2001
6,253,815	Kemp	07-2001
6-40219	Japan 219	02-1994
5,603,796	Baker	02-1997
4,750,693	Lobert et al	06-1988

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

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[1] Translations for Japan 219 (JP 06-040219) and Japan 135 (JP 11-59135) are provided in the APPENDIX TO THE EXAMINER'S ANSWER. As noted in part (6) of this examiner's answer, Japan 135 has been removed from the rejection using Ohsawa as a primary reference and is not relied upon in any rejection of the claims under appeal.

<u>Drews (sidewall)</u>

Claims 1, 2, 5-9, 14-15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drews 302 (US 4,284,302) in view of Fronek et al (US 5,848,769) and optionally Drews 290 (US 4,180,290).

<u>This rejection is applied because Drews 302 teaches providing projections on a tire sidewall *and* forming the projections so as to be undercut *and* sizing the projections such that the projections are microscopic</u>.

Drews 302 discloses a tire 11 being formed of rubber and comprising sidewalls. See col. 5 lines 12-17. Hence, Drews 302 teaches a tire having a plurality of radially outer rubber components (a tire having rubber sidewalls). **Drews 302 teaches providing the sidewalls of the tire with <u>undercut projections</u> (undercut wave shaped flutes 9) to minimize friction and drag forces caused by the movement of the tire through air.** See figures 1-6, especially figure 4. As can be seen from figure 4, each projection (flute 9) has an apex, a first side and a second side wherein (a) the first side of the projection (flute 9) is longer than the second side and (b) the second side forms an undercut extending beneath the apex. With respect to the flute being undercut, Drews 302 illustrates the projection (flute) as being **undercut**. See for example figure 4. Also, Drews 302 refers to his previous application 798,417 now US 4180290. Drews 290 (US 4180290) more clearly indicates that the flutes are **undercut**. See col. 3 lines 28-45 and figure 4 of Drews 290. Claim 1 fails to require the "undercut" (a term not mentioned in the specification) to be defined by the entire second side and an exposed radially outer surface. The first side and second side of the projection (flute

9) is illustrated in figure 4 as defining an <u>acute angle alpha of about 40 degrees</u> (falling within the claimed range of 5 to 60 degrees). Any tangent to the long first side of the flute 9 of Drews 302 cuts the radially outer surface at an acute angle as claimed. Appellants' define "The radially outer surface Si (S1 to S6 in the description hereafter) is defined as following the radially most exterior surface of the tire bare of any projections according to the invention" (paragraph 12 on page 2 of the specification). Using appellants' definition in the specification, the radially outer surface of Drews 302's tire is the surface connecting the lowest points of the troughs because the flutes are located above such a surface whereas no flutes are located below the surface. Any tangent to the long first side of the flute must intersect the "radially outer surface" at an acute angle because the long first side is concave. A tangent to the lowest point of the trough is a tangent to the "radially outer surface" instead of a tangent to the "long first side". In Drews 302's adhesive tape embodiment (figure 4), the radially outer surface is the surface connecting the lowest points of the troughs 16 from which the sides of the flutes 9 (projections) originate. Drews 302's figure 4 embodiment corresponds to appellants' adhesive tape embodiment. In Drews 302's integrally molded embodiment (col. 5 lines 13-24), the radially outer surface is the surface connecting the lowest points of the troughs from which the sides of the flutes (projections) originate. Drews 302's integrally molded embodiment corresponds to appellants' molded embodiment (the tire made using the mold). Claim 1 is generic to appellants' adhesive tape embodiment and appellants' molded embodiment. With respect to the limitation of more than 75% of the projections, all of the projections of Drews 302 have the flute shape. In other words,

100% of the undercut projections of Drews 302 have the long first side, which as discussed above, cuts the radially outer surface at an acute angle as claimed. As to height, Drews 302 states:

> As noted previously, the various surface elements have been illustrated of a size to clearly show the preferred shapes and relationship of parts. The elements as shown may be enlarged when compared to practical implementation. For example, the fluted members and projections on the order of 1/16 to 1/8 inch [1587.5 micrometers to 3175 micrometers] may provide the desired interaction. **The size may even be smaller and in some cases may advantageously be <u>microscopic</u>.** However, size is not considered critical, but **will normally be as small as practical** to produce the desired interaction. (col.8 lines 28-38, emphasis added)

Drews 302 does not specifically recite the projections as having a height of 0.2 to 100 micrometers.

As to claim 1, it would have been obvious to one of ordinary skill in the art to provide the undercut projections of Drews 302 on a rubber sidewall such that the long first side and short second side define an <u>angle alpha of 5-60 degrees</u> and have a <u>height of 0.2 to 100 micrometers</u> since (1) Drews 302 teaches forming undercut projections on the rubber sidewall of a tire such that (a) the long side and short side define a relatively small acute angle (figure 4 illustrating an angle of about <u>40 degrees</u>) and (b) the undercut projections have a size which is <u>microscopic</u>; (2) Drews 302 teaches that the undercut projections *minimize friction and drag forces*; and (3) Fronek et al suggests providing projections *for reducing drag* with a height of about <u>10 to 250 micrometers</u> (col. 6 line 26-49). It is noted that Fronek et al teaches using the microscopic sized projections for the surface of an airplane, boat or motor vehicle (col. 5 lines 25-28). It is also noted that Fronek et al uses a 100 power microscope to examine

the projections (column 10). No unexpected results over the above applied prior art has been shown.

As to the dependent claims: As to claims 2 and 5-9, it would have been obvious to one of ordinary skill in the art to provide Drews 302's projections with the claimed characteristics in view of the shape and arrangement of the projections (flutes 9) shown by Drews 302 / Fronek et al's teachings for example at col. 6 as to suitable characteristics for projections, which like those of Drews 302 are for reducing drag. It is noted that Drews 302's illustrated asymmetrically shaped undercut projections, which are at a spacing of zero micrometers, have curved sides and define acute angles and that the radial alignment of Drews 302's projections (figure 5) cause neighboring projections to be non-parallel and define with each other a very small acute angle. It is noted that Fronek et al suggests a spacing of 10-250 micrometers, varying height and varying included angles. More specifically, Drews 302 suggests forming an acute angle between the concave long side and the radially outer surface (claim 2); the radial alignment of Drews 302's projections as shown in figure 5 cause neighboring projections to be non-parallel and define with each other a very small acute angle (claim 5), Drews flutes 9 (projections) are at a spacing of zero micrometers (claim 6), the sides of Drews 302's flutes are concave and thereby slightly curved (claim 7); Fronek et al suggests using projections having varying characteristics such as height and/or width (claims 8 and 9). It is noted that the height and width of the peaks determines the angle alpha. As to claims 14-15, Drews 302 teaches providing the sidewall of a tire with the

flutes 9 (projections). As to claim 18, one of ordinary skill in the art would readily understand that Drews 302's rubber tire is vulcanized.

Claims 15, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drews 302 in view of Fronek et al and optionally Drews 290 as applied above and further in view of Kemp et al (US 6253815).

As to claim 15, it would have been obvious to one of ordinary skill in the art to provide Drews 302's tire sidewall with "lettering" as claimed since (1) Drews 302 teaches using microscopic projections on the sidewall of a tire and (2) Kemp, which teaches projections having a size such as 250 micrometers to reflect light and improve visibility of indicia, suggests forming letters on the sidewall of a tire.

As to claims 16 and 18, it would have been obvious to one of ordinary skill in the art to provide the claimed mold for the tire suggested by Drews 302 and Fronek et al in view of Kemp et al's teaching to provide a mold having surfaces for curing (vulcanizing) a tire having projections wherein the shape of the surfaces correspond to the shape of the projections. See col. 10 lines 24-36 of Kemp et al. The use of a mold is consistent with Drews 302's teaching that the tire sidewall may have integrally molded flutes (col. 5 lines 13-24).

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Drews 302 in view of Fronek et al and optionally Drews 290 as applied above and further in view of Japan 219 (JP 6-40219) or Baker (US 5603796).

As to claim 17, it would have been obvious to make a rubber tire using a tape having projections and an adhering step as claimed in view of (1) Drews 302's teaching

to provide the sidewall of a tire formed of rubber with projections, (2) Drews 302's teaching that projections may be provided on a surface by adhering a tape having the projections to the surface (col. 5 lines 40-52) and (3) (a) Japan 219's teaching that a tape (annular sticker) may be adhered to the sidewall of a pneumatic tire (vulcanized rubber tire) or (b) Baker's teaching to bond a tape (applique with recesses) to a vulcanized tire.

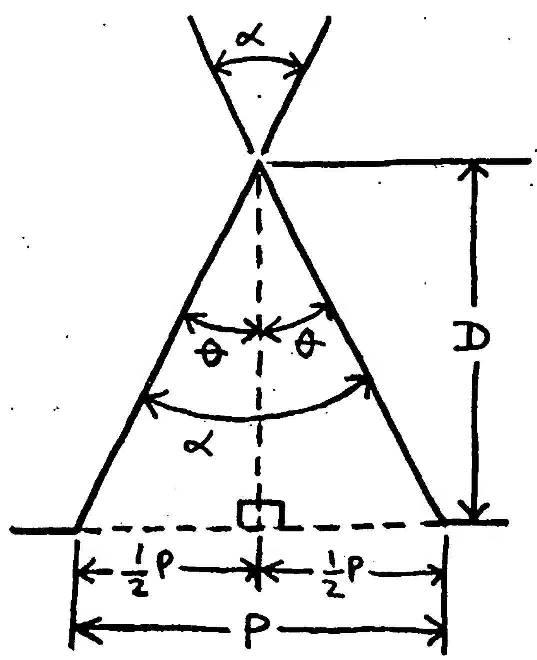
Ohsawa (tread)

Claims 1-16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa (US 2001/0032691) in view of at least one of Lobert et al (US 4750693) and Drews 302.

This rejection is applied since Ohsawa teaches providing projections in a groove of a tire tread and providing the projections with a height of 10-500 micrometers such as 50 micrometers (falling within the claimed range of 0.2-100 micrometers) and using the projections to reduce resistance between the groove surfaces and water.

Ohsawa discloses a pneumatic radial tire having a size such as PSR 205/55R16 (page 12). As readily understood by one of ordinary skill in the art, such a tire has a rubber tread and rubber sidewalls. Each of the tread and sidewalls is a radially outer rubber component. The tire has a tread comprising grooves wherein projections are provided on the sidewalls and bottom of the groove. The projections have a depth (height) of 0.01-0.5 mm (10 to 500 micrometers) such as 0.05 mm (50 micrometers). In figure 3 (symmetrical projections) and figure 15 (asymmetrical projections), any plane tangent to a first side of the projection cuts the radially outer surface (the surface

following the surface of the groove wall bare of the projections) at an acute angle because they have a triangular shape. The projections reduce resistance to the flow of water in the grooves to improve drainage efficiency of the grooves. Ohsawa teaches "... a number of minute vortexes can be generated along the groove walls to reduce the frictional resistance between the water and the groove walls thereby to improve the wet performances at an actual running time" (paragraph 14). The pitch P of the projections is less than or equal to two times the depth D. See paragraph 27. Ohsawa's teaching to use **P ≤ 2D** strongly suggests using an angle within the claimed range of 5 to 60 degrees. An illustration of one of Ohsawa's triangle projections is provided below:



The above figure was provided on page 3 of the office action dated 5-18-04. In the tire of Example 1, the depth D is 0.05 mm (50 micrometers) and the pitch P is 0.05 mm (50 micrometers). See paragraph 258. Since P = D in example 1, Ohsawa's formula $P \leq 2D$ is satisfied. With reference to the above noted figure, angle θ = 26.6 degrees ($\tan \theta$ = 0.025 mm / 0.05 mm). Since "angle α" equals 2θ, the angle α is 53.2 degrees (falling within the claimed range of 5-60 degrees). Hence, the tire in Example 1 in which P = D, an angle α of <u>53.2 degrees</u> is defined. Another example: In the tire g of Table 1 in which **P = 0.75 D**, an angle of <u>41.1 degrees</u> is defined. At paragraph 23, Ohsawa teaches that asymmetrically shaped grooves, which define asymmetrically shaped projections, may be used. At paragraph 164, Ohsawa teaches that other shapes may be used for the smaller grooves defining the projections "if they have the effect to reduce the resistance to the water flow". Ohsawa does not recite using undercut projections.

As to claim 1 (tire), it would have been obvious to one of ordinary skill in the art to configure Ohsawa's projections such that

- the projection is undercut,
- the projection has two sides of unequal length and is thereby asymmetrical, and
- the two sides of unequal length define an angle alpha of 5-60 degrees (a relatively small acute angle)

since (1) Ohsawa, directed to the problem of reducing resistance of water flow, teaches forming projections with a desired shape (e.g. an asymmetrical shape) such that the

pitch is less than two times the depth and so that resistance to flow of water is reduced, (2) at least one of Lobert et al and Drews 302 suggest forming projections for reducing resistance to fluid flow such that the projections are undercut. Lobert et al, directed to reducing drag between a moving body and a flowing medium such as water, teaches using an undercut asymmetrical shape (figure 4b, figure 5b) for projections for reducing resistance to a flowing medium. Lobert et al suggests using undercut asymmetrically shaped projections (figure 4b, figure 5b) *as an alternative to* asymmetrical projections, which are not undercut (figure 4a, figure 5a). Lobert et al is reasonably pertinent to the problem faced by Ohsawa. Both Ohsawa and Lobert et al are directed to the same problem of reducing friction between fluid and a surface. See figure 4b, 5b and claim 1 of Lobert et al. Both Ohsawa and Lobert et al use the same solution (small asymmetrically shaped projections having a height in the micrometer range) to reduce friction between water and a surface. Drews 302, discussed above, is reasonably pertinent to the problem faced by Ohsawa. Ohsawa and Drews 302 are directed to the same problem of reducing friction between fluid and a surface. Both Ohsawa and Drews 302 use the same solution (small asymmetrically shaped projections having a height in the micrometer range) to reduce friction between fluid and a surface. Moreover, Ohsawa and Drews 302 are in the same field of endeavor - tires. No unexpected results over the applied prior art has been shown.

As to claim 16 (mold), Ohsawa teaches using a vulcanizing mold. See for example paragraph 209. One of ordinary skill in the art would readily understand that the mold has surfaces corresponding to the projections so that an actual tire having

such projections can be vulcanized. The suggestion to modify the projections of Ohsawa to have the claimed undercut comes from the secondary art to at least one of Lobert et al and Drews 302.

As to the dependent claims: As to claim 2, the claimed angle of 15-55 degrees would have been obvious in view of Ohsawa's teaching to form asymmetrical projections with a pitch less than two times the depth to reduce resistance to flow and the suggestion from at least one of Lobert et al and Drews 302 to undercut asymmetrically shaped projections to reduce resistance to fluid flow. As to claims 3 and 4, the limitation of curved line apexes / tangent at height not exceeding 75% of the total height would have been obvious since Ohsawa suggests that the peaks of the projections may be curved (see e.g. figure 9). As to claim 5, the claimed non-zero angle beta being between -15 degrees and +15 degrees would have been obvious in view of Ohsawa's suggestion to use grooves to define projections and Ohsawa's teaching that the grooves may be inclined and non-parallel (figure 22). As to claim 6 (distance d being 0-100 micrometers), note the spacing of the projections disclosed by Ohsawa (the spacing in figure 3 for example is zero micrometers). As to claim 7, the limitation of the sides being slightly curved would have been obvious since Ohsawa suggests that the sides of the projections may be curved (see e.g. figure 9). It is noted again that Drews 302 provides the requisite suggestion to use an undercut configuration for Ohsawa's projections. When using such an undercut, Drews 302 teaches using curved concave sides. As to claim 8, the claimed varying angle alpha would have been obvious in view of Ohsawa's suggestion to vary angle theta 1 (figure 15) so that the tire can easily be

removed from the mold. As to claim 9, the claimed varying height would have been obvious since Ohsawa shows varying height (figure 15) so that the tire can easily be removed from the mold. As to claims 10-13, Ohsawa teaches providing the projections in a groove of a tread (e.g. on the sidewalls and bottom of a groove). As to claim 14, Ohsawa's tire includes rubber sidewalls. Claim 14 does not require projections on the "at least a further radially outer rubber component". As to claim 15, the description of "lettering" fails to require structure different from that disclosed in Ohsawa. Ohsawa's projections on located on blocks having the shape of the shape of the letter "I". As to claim 18 (vulcanizing tire), Ohsawa as noted above teaches using a vulcanizing mold to form the tire wherein the surface of the mold has a profile corresponding to the profile of the projections. The suggestion to use an undercut comes from the secondary art to at least one of Lobert et al and Drews 302.

(10) Response to Argument

ALLOWABLE SUBJECT MATTER

In the advisory action dated 4-27-06, examiner indicated that claims 1-18 would be allowable if (1) claims 1, 16 and 17 are amended to include the subject matter of figure 3 (e.g. claim 1 line 8 is amended by inserting --having a convex surface extending from and-- after "the second side (2')"), (2) dependent claim 7 is appropriately amended in view of the amendment to claim 1 and (3) literal antecedent basis is provided by inserting --convex-- before "sides 32 and 32'" at line 3 of paragraph 37 on page 6 of the specification. Examiner further explained: "Support for the proposed changes may be found in original figure 3 and paragraph 26 on page 4 of the specification. Although

disclosing concave sides (figure 4 of Drews 302) or straight sides (figure 4b of Lobert et al), the applied prior art fails to suggest 'the second side (2)') having a <u>convex surface extending from and forming with</u> the outer surface (S1) an <u>undercut</u> extending beneath the apex (P)' (emphasis added) in combination with the remaining limitations of claim 1." (page 2 of advisory action dated 4-27-06, emphasis in original). Since the prior art of record fails to establish a prima facie case of obviousness for claims 1, 16 and 17 as proposed by examiner, appellants' alleged "unexpected results" are neither necessary nor relied upon in the above noted holding by the examiner of allowable subject matter.

Appellants argue that claims 1-18 are allowable for the same reasons as the Examiner acknowledges claims 1-18 would be patentable over the cited art if amended as above. Appellants submit that the same rationale must logically conclude patentability in both cases (Brief pages 4-5). Appellants are incorrect because claim 1 as proposed by the examiner requires the second side to have a convex surface extending from the outer surface (S1) whereas appealed claim 1 fails to require the second side to have a convex surface. Claim 1 is generic to concave sides, convex sides and straight sides. See claims 1, 3 and claim 7.

Appellants state: "... the Examiner is inconsistent in concluding the present invention as claimed does not achieve unexpected results when the invention, if amended as set forth in the Advisory Action, does achieve unexpected results." (Brief page 9). Appellants also state: "The Examiner's argument that no unexpected results are present invention is unsupported argument and conclusion, and is inconsistent with the position taken by the Examiner in the Advisory Action [dated 4-27-06]" (Brief page

14). Appellants also state: "... the Examiner's position as to the lack of 'unexpected results' is inconsistent with the representation that claims 1-18 would be allowable if amended," (Brief page 15). These statements are incorrect. Appellants are confusing their burden to show unexpected results (when, as in this case, appellants present arguments relying on the unexpected results for patentability of appealed claim 1) with the failure of the prior art to establish a prima facie case of obviousness for the examiner's proposed claim 1. There is no factual evidence of record showing unexpected results for either appealed claim 1 or the examiner's proposed claim 1. Appellants' alleged "unexpected results" are not relied upon in the above noted holding by the examiner of allowable subject matter.

MICROSCOPIC SIZE

The SPECIFICATION describes improving dirt repellence, self cleaning effect, water repellence and color shade special effects. The original disclosure teaches that dirt repellence is obtained because "... <u>the size</u> of the dirt particles is relatively larger than the dimension of the micro-grooves thus formed" (paragraph 15 on page 3 of specification, emphasis added).

CLAIM 1 defines the height of the apex of the protrusions as being <u>"0.2 to 100 micrometers"</u> (a microscopic size).

DREWS 302 teaches alternating flutes 9 (projections) and troughs 16 ("micro-grooves") wherein flutes 9 (projections) have a <u>"microscopic"</u> size. Drews 302 uses the projections on a TIRE to reduce drag.

FRONEK ET AL teaches alternating peaks (projections) and valleys ("micro-grooves") wherein the peaks have a height of 10 to 250 micrometers, preferably 20 to 150 micrometers (a microscopic size). Fronek et al teaches using the projections to reduce drag for airplanes, boats and motor vehicles. In the examples, Fronek et al uses a 100 power microscope to examine the peaks and valleys.

OHSAWA teaches alternating projections and smaller grooves ("micro-grooves"). Ohsawa teaches using a depth of 10-500 micrometers. The projections have a corresponding height of 10-500 micrometers. In example 1, the smaller grooves have a depth of 50 micrometers and the projections have a height of 50 micrometers. Ohsawa teaches using the projections and grooves on a TIRE to reduce frictional resistance between a groove wall of a tire tread and water.

LOBERT ET AL teaches using the alternating projections and grooves to reduce frictional drag between a vehicle surface and a medium such as water. Lobert et al teaches that the depths of the grooves and the heights of the projections lie in the region of micrometers. Lobert et al teaches a projection height of 0.3 micrometers.

DREWS 302

Appellants argue that a projection in which any plane tangent to the first side (2) of the projection cutting the radially outer surface (S1) at an acute angle "... results in a non-concave side (2) ..." (Brief page 17). Examiner disagrees. Claim 1 is generic to the first and second sizes being straight, concave and convex. See claims 1, 3 and 7.

Drews 302 discloses providing a TIRE SIDEWALL with **undercut projections** (undercut wave shaped flutes 9) having a microscopic size to minimize friction and drag

forces caused by the movement of the tire through the air. Fronek et al motivates one of ordinary skill in the art to provide Drews 302's microscopic undercut projections with the claimed microscopic height of 0.2 to 100 micrometers since Fronek et al suggests using a microscopic height of 10 to 250 micrometers for projections, which like those of Drews 302, function to reduce drag. *Appellants fail to argue that it would have been unobvious to provide Drews 302's projections with a height of 0.2-100 micrometers for the purpose of reducing drag.*

Appellants argue that Drews 302 fails to teach the use of acute projections on a radially outer tire surface (S1) with projections located on a radially outer tire component. Appellants are incorrect. Drews 302 teaches using the flutes 9 (projections) on the sidewall of a tire 11 (figures 1, 5, 6). The tire sidewall is a radially outer tire component and corresponds directly to claim 14. In Drews 302's adhesive tape embodiment (figure 4), the radially outer surface is the surface connecting the lowest points of the troughs 9 from which the sides of the flutes 9 (projections) originate. Drews figure 4 embodiment corresponds to appellants' adhesive tape embodiment. In Drews 302's integrally molded embodiment (col. 5 lines 12-24), the radially outer surface is the surface connecting the lowest points of the troughs from which the sides of the flutes (projections) originate. Drews 302's integrally molded embodiment corresponds to appellants' other embodiment (the tire made using the mold). Claim 1 is generic to appellants' adhesive tape embodiment and appellants' molded embodiment.

Appellants argue and examiner agrees that the first and second sides of claim 1 *originate* from the radially outer surface. Examiner adds that the first and second sides

of claim 1 also *intersect* to form apex (P).[2] A tangent to the lowest point in appellants' figure 1 is a tangent to the radially outer surface *instead of* a tangent to the first side. A tangent to the highest point in appellants' figure 1 is a tangent to the apex *instead of* a tangent to the first side. This is especially true in appellants' figure 2 (described in claim 3) because a tangent to the rounded apex is parallel to the radially outer surface and cannot cut the radially outer surface at an acute angle.

Appellants argue that Drews 302 does not teach or suggest a projection in which any plane tangent to the first side (2) of the projection cuts the radially outer surface (S1) at an acute angle. Examiner disagrees. **Any plane tangent** to the long first side of the flute 9 of Drews 302 cuts the radially outer surface at an acute angle as claimed. Appellants' define **"radially outer surface"** as " ... following the radially most exterior surface of the tire bare of any projections according to the invention" (paragraph 12 on page 2 of the specification). Appellants use this definition including the phrase " ... following the radially most exterior surface of the tire bare of projections ... " because, strictly speaking, the first and second sides of the projections instead of the surface Si define the radially outer surface of the tire sidewall having the projections at the region in which the projections are located. Using appellants' definition in the specification, the radially outer surface in figure 4 of Drews 302 must be the surface connecting the lowest points of the troughs 16 because the flutes 9 are located above such a surface whereas no flutes 9 are located below the surface. Any tangent to the long first side of

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[2] In addition to ignoring the specification's definition of "radially outer surface", appellants overlook the limitation of the first and second sides intersecting to form an apex when discussing the any plane tangent subject matter.

the flute 9 must intersect the "radially outer surface" at an acute angle because the long first side is concave. A tangent to the lowest point of the depression trough 16 is a tangent to the "radially outer surface" *instead of* a tangent to the "long first side".

Appellants argue that Drews 302 fails to disclose a second side (2') forming with the radially outer surface (S1) an **undercut** extending beneath the apex because the second side portion of Drews 302 extends beyond the apex. Appellants are incorrect. Appellants define "radially outer surface" as " ... following the radially most exterior surface of the tire bare of any projections according to the invention" (paragraph 12 on page 2 of the specification). In Drews 302, the radially outer surface is the surface connecting the lowest points of the troughs 16 and the second side forms an undercut with that surface. See figure 4 of Drews 302. The "radially outer surface" in Drews 302, like that in appellants' tire, extends beneath and across the entire bottom of the projection. Appellants comment that "... the second claimed side forms from its plane of origin (S1) to the apex (P) an undercut", (Brief page 8). Claim 1 fails to require the "undercut" (a term not mentioned in the specification) to be defined by the entire second side and an exposed radially outer surface not covered by a projection. In short, claim 1 fails to require an undercut at the bottom corner of the projection.

Appellants refer to the marked up figure 4 of Drews 302 in Exhibit A.[3] In particular, appellants argue that a tangent T1 to the surface defined by a series of points P would lie within that surface and not intersect such a surface at all. This argument is

[3] Examiner considers Exhibit A to be attorney argument and appellants' arguments based thereon were addressed by the examiner on pages 8 and 9 of the advisory action dated 4-27-06.

neither understood nor persuasive since a tangent to a point P in the surface defined by the series of points P is a tangent to the "radially outer surface" *instead of* the "first sides". Furthermore, appellants' argument that a series of points P defining a surface is an untenable position is contrary to the specification's definition of "radially outer surface" as " ... following the radially most exterior surface of the tire bare of any projections according to the invention" (paragraph 12 on page 2 of the specification).

Appellants argue that "efficiency", "sufficient efficiency", "size" and "microscopic" in Drews 302 are vague, ambiguous, non-specific, and unclear (Brief page 7, last full paragraph on page 13 and sentence spanning pages 16 and 17). One of ordinary skill in the art would have no difficulty interpreting Drews 302's disclosure at col. 8 lines 28-38. In light of Drews 302's disclosure including the figures and the description at col. 8 lines 28-38, there is no ambiguity in the actual language used by Drew 302 and one of ordinary skill in the art would readily understand the terms "size" and "microscopic". It is emphasized that Drews 302 teaches using the fluted surface for tires to reduce drag.

With respect to the size of Drews 302's fluted members (undercut projections best seen in figure 4), appellants argue: "For the Examiner to extrapolate the teachings of Drews in which the preferred flute size is on the order of <u>1/16 to 1/8 inches to equate with the .2 to 100 micrometers</u> recited in the claims is not properly founded and based solely on a re-constructing of Drews based solely on hindsight." (Brief page 6, emphasis added). Appellants also argue that "There is no teaching in Drews that would instruct one of skill in the art <u>to reduce flutes</u> of about 1/16 to 1/8 inches <u>down to</u> .2 to 100 micrometers ..." (Brief page 6, emphasis added). These arguments are inconsistent

with Drews 302's express teaching at col. 8 lines 28-38 to reduce the size of the fluted members down to **"microscopic."** The claimed range of 0.2 to 100 micrometers is a microscopic size. Appellants apparently agree that the claimed range of 0.2 to 100 micrometers is a microscopic size (a size too small to be seen by the unaided eye but large enough to be studied by a microscope) as they present no argument and/or evidence to the contrary.

Appellants state "As to the terms 'size' and 'microscopic' the Examiner's position that such terms encompass any projection size is untenable" (Brief page 16). This statement is incorrect. Unlike appellants, examiner considers "microscopic" to be a significantly smaller size than "1/16 to 1/8 inch". See col. 8 lines 28-38 of Drews 302.

Appellants argue and the examiner agrees that the language of "microscopic" must be taken in the context of Drews 302's purpose to reduce drag. Drews 302 uses the microscopic projections on the tire to reduce drag and Fronek et al instructs one of ordinary skill in the art to use a height of about 10-250 micrometers for microscopic projections that reduce drag.

Appellants argue that Fronek et al lacks projections that meet the limitations of the claims as to being undercut and within a specific height range. More properly, Fronek et al teaches using a height of 10 to 250 micrometers for projections adapted to reduce drag and thereby suggests using the claimed microscopic size of 0.2 to 100 micrometers for Drews 302's undercut microscopic projections for reducing drag. When viewing the applied prior art as a whole, there is ample suggestion to use a height in the

range 0.2 to 100 micrometers for Drew 302's undercut fluted members for reducing drag.

Appellants argue that Fronek teaches a projection of totally non-analogous construction for the sole purpose of reducing drag (Brief page 16). This argument is not persuasive because Drews 302 teaches providing a tire with microscopic projections to reduce drag and Fronek et al is directed to the same problem of reducing drag.

With respect to using a size, specifically a height in the range of 0.2 to 100 micrometers for Drews 302's undercut projection for reducing drag, MPEP 2144 states: "The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant."

Appellants state: "In order to be effective in meeting all three of the objectives [dirt-repellence and water-repellence and self-cleaning], <u>the invention structure</u> needs to be smaller than the size of the dirt particles" (Brief page 7, emphasis added). Examiner acknowledges that paragraph 15 on page 3 of the specification discusses using microgrooves smaller than the size of dirt particles. However, claim 1 neither recites "invention structure" nor "micro-grooves".

Appellants argue "... the references do not address the same problems as those addressed by the instant invention and it would not, therefore, be obvious for one skilled in the art to look to the cited art for a solution." (Brief page 6). Appellants have cited no authority holding that non-obviousness must be established if the prior art fails to

identify the problems described in the specification. Moreover, appellants' argument is inconsistent with MPEP 2144, which states: "The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant."

Appellants argue "Drews flutes at 1/16 to 1/8 inch would not be functional to meeting the dual objectives of providing dirt resistance and water evacuation on radially outward tire tread projections and surfaces. The sizing of Drews channels would create dirt traps for collecting debris." (Brief page 7). Appellants additionally argue that "... the projections disclosed by Drews would not be of a size to functionally meet the objectives of the invention" (Brief page 8). These arguments are not persuasive because attorney arguments cannot take the place of evidence. See MPEP 716.01(c). Moreover, these arguments ignore Drews 302's explicit teaching to use a "microscopic" size instead of a size of 1/16 to 1/8 inch.

Appellants argue "The non-undercut Fronek projections would not effectively meet the objectives of the invention as to dirt and water repellence." (Brief page 9). This argument is not persuasive because attorney arguments cannot take the place of evidence. See MPEP 716.01(c).

Appellants argue: The differences between the Drew '302 projections and the claimed invention is therefore and results in an achievement of the stated objectives of the invention not attainable by the Drew '302 configuration." (Brief page 17). These

arguments are not persuasive because attorney arguments cannot take the place of evidence. See MPEP 716.01(c).

Appellants argue that Drews 290 adds nothing to Drews 302 (Brief page 12). The application of the optional Drews 290 appears unnecessary since Appellants apparently agree that the second side of the wave shaped flute in figure 4 of Drews 302 slopes toward the left instead of the right.

With respect to appellants' arguments regarding claim 2, Drews 302's concave first side cuts the radially outer surface at an acute angle as discussed above.

As to claim 5, appellants argue that Drews 302's neighboring projections are oriented such that their longitudinal axis are parallel. This argument is not persuasive since it is *impossible* for the longitudinal axis of neighboring radially oriented flutes to be oriented parallel.

As to claim 6, Drew 302's projections are, contrary to appellants arguments, at a spacing of zero micrometers falling within the claimed range of 0 to 100 micrometers.

With respect to appellants' arguments regarding the MOLD and PROCESS OF USING THE MOLD (claims 16 and 18), projections on tires have been made using molds having surfaces corresponding to the shape of the projections. Motivated by the desire found in Drews 302 to make a tire having microscopic undercut projections, one of ordinary skill in the art would have found it obvious in light of Kemps' disclosure to use a mold having surfaces corresponding to the small size projections (e.g. having a height for example of 250 micrometers described at col. 5 lines 9-11) to make Drews 302's tire. In the examiner's opinion, the 103 rejection of claims 16 and 18 stands or

falls with the rejection of claim 1. Appellants' argument that Kemp discloses a 90 degree angle and a height falling outside of the height of the projections is not persuasive because (1) Kemp suggests forming a tire with small projections using a mold and (2) one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Appellants argue that a capability of eliminating fluid and dirt from the surface is not found in Kemp (Brief pages 11-12). This argument is not persuasive because attorney arguments cannot take the place of evidence. See MPEP 716.01(c).

Appellants' argument regarding claim 15 (no reference teaches lettering) is not persuasive since, contrary to appellants' arguments, Kemp teaches lettering (figure 6). Kemp provides ample suggestion to provide the tire sidewall, which Drews 302 teaches is covered by the microscopic undercut projections, with lettering.

With respect to applicant's arguments regarding PROCESS OF MAKING TIRE USING TAPE (claim 17), Drews 302 suggests adhering a tape (cover member) having the projections using adhesive to a tire and Japan 219 or Baker suggests using a *vulcanized* tire when adhering a tape to a tire. With respect to appellants' specific argument that Japan 219 or Baker do not suggest a tape with undercut projections, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208

USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

OHSAWA

Ohsawa discloses providing a TIRE TREAD with smaller grooves defining projections to reduce resistance to water flow (improve water repellence) wherein the **projections** have a height of 10-500 micrometers such as 50 micrometers (a microscopic size). The applied secondary art (at least one of Lobert et al and Drews 302) provides ample suggestion to provide Ohsawa's projections with the claimed undercut since the secondary art suggests providing projections for reducing resistance to fluid flow with an undercut. In figures 4a, 4b and figures 5a, 5b, Lobert et al shows undercut projections being an alternative to projections which are not undercut. *Appellants fail to argue that it would have been unobvious to provide Ohsawa's projections with an undercut as an alternative shape for the purpose of reducing resistance to fluid flow and thereby improve resistance to hydroplaning.*

Appellants state: "... a novel shaped first projection side with an undercut formed by intersecting first and second sides that extends beneath an apex (P). Specifically, the independent claims require a first side (2) in which, in more than 75% of the projections, any plane (emphasis added) tangent to the first side (2) of the projection cuts the radially outer surface (S1) at an acute angle and the second side (2') forming with the outer surface (S1) an undercut extending beneath the apex (P)." (Brief page 18). The projections described above are not novel. See figures 4b and 5b of Lobert et

al. Except for the outer surface being that of a tire component, there is no structural difference between the claimed projections and Lobert et al's projections.

Appellants argue "The enhanced water and dispersement achieved by the present invention is not achieved by Ohsawa ..." (Brief page 10). The arguments of counsel cannot take the place of evidence in the record. See MPEP 716.01(c). Appellants have presented no evidence as to why the example 1 tire of Ohsawa does not achieve "enhanced water and dispersement". Ohsawa example 1 tire has projections on the radially outer surface (sidewalls and bottom) of a groove wherein 100% (falling within the claimed range of more than 75%) of the first sides of the projections intersects the radially outer surface at an acute angle. The height of these projections, which is equal to the depth of the smaller grooves 22, is 50 micrometers (falling within the claimed range of 0.2 to 100 micrometers). The angle alpha for these projections as discussed above is 53.2 degrees (falling within the claimed range of 5 to 60 degrees). Ohsawa's example tire 1 achieves more excellent anti-hydroplaning performance (index 105) than that of the comparative example 1 tire. Since Ohsawa's example 1 tire comprises **projections** having a <u>height of 50 micrometers</u> (falling within the claimed range of 0.2 to 100 micrometers), an <u>angle alpha of 53.2 degrees</u> (falling within the claimed range of 5 to 60 degrees), and an <u>excellent anti-hydroplaning resistance (index 105)</u>, it is not seen how the claimed tire has "improved water repellence that reduces the risk of hydroplaning" unexpectedly superior to that of Ohsawa.

Appellants argue "Severely sloping projections having a height that is within a 1 to 100 micrometer range is not taught by the reference [Ohsawa]." (Brief page 11 lines 12-13). Appellants are incorrect. See example 1 of Ohsawa.

Appellants argue "... Ohsawa has a pitch less than two times the depth but does not have an undercut shorter side in each projection such that the angle between the longer and shorter sides of each projection falls within the prescribed range." (Brief page 11). It is undisputed that example 1 of Ohsawa discloses projections having a height of 50 micrometers and an angle alpha of 53.2 degrees between the first and second sides of the projection. Appellants also admit that Ohsawa teaches asymmetrical projections (projection with a long side and a short side). The secondary art to at least one of Lobert et al and Drews 302 suggests using an undercut shape for Ohsawa's asymmetrical projections.

Appellants argue that Lobert et al does not teach projections that fall within the undercut construction and angle range of the claimed invention (Brief page 12). Appellants are incorrect. There is no difference between the undercut projections of Lobert et al and the claimed undercut projections. The projections in figures 4b and 5b are undercut asymmetrical projections having a long side and a short side. Lobert et al teaches using a depth / height in the micrometer range (claim 1). In figure 4a, the depth / height is 0.3 micrometers (falling within the claimed range of 0.2 to 100 micrometers). The illustrated angle between the long first side and the short side is about 35 degrees and about 40 degrees for the undercut projections of figures 4b and 5b respectively. An angle alpha of 35 degrees or 40 degrees falls within the claimed range of 5 to 60

degrees. Furthermore, any plane tangent to the long first side of the undercut projection of either figure 4b or figure 5b cuts a outer surface at an acute angle.

Appellants argue that the projections of Lobert et al are for entirely different purposes. This argument is not persuasive. Ohsawa's projections and Lobert et al's projections are for the same purpose of reducing friction between a surface and a fluid.

Appellants argue that the fact that the asymmetrical projections of Ohsawa are not undercut and lie outside the claimed parameters of the invention is strong evidence of non-obviousness. Examiner agrees that Ohsawa does not anticipate claim 1. However, the subject matter of claim 1 would have been obvious in view of the combination of Ohsawa and at least one of Lobert et al and Drews 302.

Appellants note that Ohsawa does not specifically recite an angle alpha of 5-60 degrees. Examiner agrees that there is no literal antecedent basis in Ohsawa for an asymmetrical shaped projection defining an angle alpha of 5-60 degrees. However, appellants admit that Ohsawa teaches asymmetrical projections (projection with a long side and a short side). Furthermore, it is undisputed that example 1 of Ohsawa discloses symmetrical projections having a height of 50 micrometers and an angle alpha of 53.2 degrees between the first and second sides of the projection.

Appellants argue that a capability of eliminating fluid and dirt from the surface is not found in Ohsawa (Brief pages 11-12). This argument is not persuasive because attorney arguments cannot take the place of evidence. See MPEP 716.01(c). It is acknowledged that the specification discloses that the size of the micro-grooves prevents dirt particles from adhering to the rubber (paragraph 15 on page 3). It is added

that the alternating grooves and projections in Ohsawa's example 1 have a height of 50 micrometers. The value of 50 micrometers falls within the claimed range of 0.2 to 100 micrometers. It is also noted that while Ohsawa discloses micro-grooves, claim 1 fails to require "micro-grooves".

It is undisputed that Ohsawa teaches an asymmetrical projection. See Brief last full paragraph on page 10 and lines 10-11 of page 13. Although Ohsawa does not recite using an undercut shape for the asymmetrical projection, Ohsawa teaches that other shapes may be used for the smaller grooves defining the projections "if they have the effect to reduce the resistance to water flow" (paragraph 164). This teaching at paragraph 164 of Ohsawa is ignored by appellants. As evidenced by the secondary art (e.g. Lobert et al), an undercut shape may be used for asymmetrical projections that reduce resistance to fluid flow. In Lobert et al, compare figure 4b with figure 4a and compare figure 5b with figure 5a. Motivated by the desire found in Ohsawa to reduce resistance to water flow to reduce the risk of hydroplaning, one of ordinary skill in the art would have found it obvious to use the undercut shape for Ohsawa's projections in light of the suggestion from at least one of Lobert et al and Drews 302 to form projections for reducing resistance to fluid flow such that the projections are undercut. In other words, at least one of Lobert et al and Drews 302 suggest providing Ohsawa's asymmetrically shaped projection with an undercut and using such a projection to obtain reduced resistance to flow as desired by Ohsawa. The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is <u>not necessary</u> that the prior art suggest the

combination to achieve the same advantage or result discovered by applicant. See MPEP 2144.

Appellants argue "It is not clear how Ohsawa can instruct one in the art to use its non-undercut projection configuration in applications for dirt and water repellence when the configuration and purpose of Ohsawa projections are decidedly different from the invention." (Brief page 13). This argument is not persuasive. "The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant." (MPEP 2144).

As to dependent claims 3-15 and 18, appellants arguments are not persuasive since Ohsawa teaches that the projections may have a curved apex, Ohsawa teaches that the grooves and projections are not required to be parallel, Ohsawa teaches a spacing of zero micrometers, Ohsawa and Drews 302 teach curved sides for projections, Ohsawa teaches varying height and angle of the projections to facilitate removal of the tire from the mold, Ohsawa teaches locating the projections on the sidewalls and bottom of a groove in a tread, Ohsawa's tire has rubber sidewalls, the blocks have the shape of the letter "I" and claim 18 fails to require the tape.

With respect to appellants' arguments regarding the MOLD and PROCESS OF USING THE MOLD (claims 16 and 18), projections on tires have been made using molds having surfaces corresponding to the shape of the projections. Motivated by the suggestion found in at least one of Lobert et al and Drews 302 to use an undercut

shape for Ohsawa's projections, one of ordinary skill in the art would have found it obvious in light of Ohsawa's disclosure to use a mold having surfaces corresponding to the projections (paragraph 209) to make the tire of Ohsawa as modified by at least one of Lobert et al and Drews 302. In the examiner's opinion, the 103 rejection of claims 16 and 18 stands or falls with the rejection of claim 1.

"UNEXPECTED RESULTS"

Appellants identify the following properties of the claimed invention: "... enhanced self-cleaning; improved optical appearance; improved water repellence that reduces the risk of aquaplaning; and allow for color differentiation" (Brief pages 5 and 6). With respect to the properties of self-cleaning, water repellence and optical effects and applicant's reliance on those properties to establish nonobviousness, "... the statement that a *prima facie* obviousness rejection is not supported if no reference shows or suggests the newly-discovered properties and results of a claimed structure is not the law." *In re Dillon*, 16 USPQ 1897, 1901 (Fed. Cir. 1990), *cert. denied*, 500 U.S. 904 (1991) (affirmance of obviousness rejection wherein claimed invention addressed problem of reducing solid particles during combustion of fuel whereas applied prior art addressed problem of dewatering fuel).

Appellants argue "The Examiner is incorrect in concluding that the present invention does not achieve unexpected results in view of the applied prior art for neither reference individually or in combination can accomplish the stated objectives of the invention" (Brief page 9). This argument is not factually supported by objective evidence and is therefore not persuasive. See MPEP 716.01(c), which states:

"Objective evidence which must be factually supported by an appropriate affidavit or declaration to be of probative value includes evidence of unexpected results, commercial success, solution of a long-felt need, inoperability of the prior art, invention before the date of the reference, and allegations that the author(s) of the prior art derived the disclosed subject matter from the applicant. See, for example, In re De Blaue, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984) ('It is well settled that unexpected results must be established by factual evidence. ...'. '[A]ppellants have not presented any experimental data showing that prior heat-shrinkable articles split. due to the absence of tests comparing appellant's heat shrinkable articles with those of the closest prior art, we conclude that appellant's assertions of unexpected results constitute mere argument.')" (emphasis added).

Appellants state: "The Examiner has denied the existence of unexpected results despite the success of the claimed invention in solving a set of problems unsolved by the prior art. One skilled in the art, upon consideration of specification's specific stated objectives of the invention, would readily understand the success of the invention in meeting such objectives." (Brief page 16). Appellants have not proffered any objective evidence on this record for the requisite factual support for Appellants' assertion of unexpected results. It is well settled that arguments in the Brief cannot take the place of objective evidence. *In re Pearson*, 494 F.2d 1399, 1405, 181 USPQ 641, 646 (CCPA 1974).

Appellants state: "... a result that includes simultaneous achievement of reduced hydroplaning, optical and color differentiation, and a reduced dirt in collection channels

would not be unexpected when none of the cited art achieves that result." (Brief page 15). With respect to unexpected results, applicant has the burden to show unexpected results and applicant has failed to meet that burden. See MPEP 716.01(c) and MPEP 716.02(b). It is emphasized that attorney arguments cannot take the place of evidence. See MPEP 716.01(c).

Appellants argue that " ,,, 'unexpected results' is inherent in the advantages attained by the claimed invention over the cited art ..." (Brief page 4). Appellants have presented no objective evidence to support the argument that the claimed invention obtains unexpected results over the cited art.

Appellants argue that the structure defined in the claims "... do not create structural traps for dirt and debris" (Brief page 7). This argument is not factually supported by objective evidence and is therefore not persuasive. See MPEP 716.01(c).

Appellants argue: "The projections on the radially outward tire component have a configuration that provides dirt-repellence and water-repellence and is self-cleaning. In addition, the projections and their orientation provide a visual differentiation in the surface." (Brief page 7). This argument is not factually supported by objective evidence and is therefore not persuasive. See MPEP 716.01(c).

Appellants argue "The problems that the invention solves are dirt repellence and water repellence in combination with the capability for visible surface differentiation" and "One skilled in the art would readily recognize the attainment by the claimed invention of the objectives found in the specification; objectives that cannot be achieved by any of the cited art singularly or in combination" (Brief pages 14 and 15). This argument is not

factually supported by objective evidence and is therefore not persuasive. See MPEP 716.01(c).

Appellants argue that "... one of ordinary skill in the art would not look to design features meant to address an entirely different set of objectives for instruction in dirt and water repellence in combination with visual surface differentiation; and ... the nature of the problem solved by the invention is different and unrelated to the problem of drag reduction addressed by the cited art." (Brief page 15). "The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant." See MPEP 2144.

The claimed invention has not been compared with either Drews 302 or Ohsawa. The original specification contains description comparing the disclosed invention with a tire having a smooth surface, but does not contain description comparing the disclosed invention with the minutely crenate pattern of either Drews 302 or Ohsawa. Although the original disclosure mentions reducing air resistance (paragraph 7 of specification), the specification contains no experimental data factually supporting the conclusion that the claimed invention unexpectedly reduces air resistance compared with the reduction in air resistance obtained by Drews 302. Although the original disclosure describes reducing the risk of aquaplaning (paragraph 16 of specification), the specification contains no experimental data factually supporting the conclusion that the claimed invention unexpectedly reduces the risk of aquaplaning compared with the reduction in

the risk of aquaplaning obtained by Ohsawa; it being noted that Ohsawa's Example 1 tire had excellent hydroplaning resistance (index 105, paragraphs 258, 264) compared to the hydroplaning resistance (index 100) for the comparative tire having smooth side faces and bottom face of the circumferential and transverse grooves. With respect to dirt repellence and optical properties, the specification does not describe improving those properties when using only two projections (claim 1 reads on at least two projections) and does not compare the claimed invention with the improvement in dirt repellence and water repellence achieved by the microscopic projections and microscopic grooves of either Drews 302 or Ohsawa. Experimental data has not been presented comparing the claimed invention to Drews 302 or Ohsawa so as to factually support appellants' unexpected results argument that the present invention simultaneously achieves reduced hydroplaning, optical and color differentiation and reduced dirt in collection channels whereas none of the cited art simultaneously achieves reduced hydroplaning, optical and color differentiation and reduced dirt in collection channels.

CONCLUSION

The motivation / suggestion to combine may address the problem of reducing resistance to air flow or the problem of improving hydroplaning resistance by reducing resistance to water flow. Contrary to appellants' arguments, there is no requirement for the applied prior art to simultaneously address problems of dirt repellence, water repellence that reduces risk of hydroplaning, and optical appearance.

The problems of dirt repellence, water repellence that reduces risk of hydroplaning, and optical appearance have been considered. However, it is not known how much dirt repellence, water repellence and optical appearance the claimed invention achieves. It is not known if the claimed invention has better dirt repellence, water repellence and optical appearance than either Drews 302 or Ohsawa. It is not known if the shape of an undercut (in contrast to the microscopic size of the micro-groove discussed at paragraph 15) achieves improved dirt repellence, water repellence and optical appearance.

The closest prior art is either Drews 302 (TIRE SIDEWALL + UNDERCUT PROJECTION + MICROSCOPIC SIZE) or Ohsawa (TIRE TREAD + PROJECTION + MICROSCOPIC HEIGHT). The claimed invention (tire sidewall or tire tread + undercut projection + microscopic height of 0.2 to 100 micrometers) has not been compared to either Drews 302 or Ohsawa. There is no experimental data in the original specification and/or a 132 declaration factually supporting appellants' unexpected results argument that the present invention simultaneously achieves reduced hydroplaning, optical and color differentiation and reduced dirt in collection channels whereas none of the cited art simultaneously achieves reduced hydroplaning, optical and color differentiation and reduced dirt in collection channels.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Steven D. Maki
4-13-07
STEVEN D. MAKI
PRIMARY EXAMINER

Steven D. Maki
April 13, 2007

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10/024869

APPENDIX TO EXAMINER'S ANSWER

10/024869

APPENDIX TO EXAMINER'S ANSWER

PTO: 2007-001039

Japanese Published Unexamined Patent Application (A) No. 06-040219, published February 15, 1994; Application Filing No. 4-214787, filed July 21, 1992; Inventor(s): Katsuji Tanimoto; Assignee: Sumitomo Rubber Engineering, Inc.; Japanese Title: Pneumatic Tires

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PNEUMATIC TIRES

CLAIM(S)

A pneumatic tire having an annular tread, a pair of sidewalls extending from both edges of tread in the radial direction, and a bead section at the inner edge of each sidewall in the radial direction; said tire being characterized in that an annular groove is made at a proper place of the sidewall concentrically with the tire, that the bottom surface of the groove is made planar, and that a heat-resistant and rain-resistant sticker, which is not easily peeled off, is bonded to the bottom surface of said groove.

DETAILED DESCRIPTION OF THE INVENTION

(0001)

(Field of Industrial Application)

The present invention pertains to a pneumatic tire with a design improved by applying an ornament to a sidewall.

(0002)

(Prior Art)

In the past, as an enhanced fashion of a passenger vehicle, it has been generally known, a sidewall ornament of tire, which is a white line formed in annular form concentrically with the tire by using a white rubber such as PCR, or a white letter of characters and codes.

(0003)

(Problems of the Prior Art to Be Addressed)

With the aforementioned white line and white letter, which are the prior art sidewall ornaments, carbon is penetrated from the surrounding black rubber with which they are contacting, and the white lines and white letters tend to be discolored by this structural contamination. To prevent the black rubber from contaminating the white rubber, a rubber different from a general rubber needs to be installed around the white rubber, which causes problems that the rubber composition becomes more complex, and that a white rubber, for its being not so durable, is difficult to use for high performance tires requiring high-speed operation. Also, a white rubber is prone to be contamination and result in getting black spots by abrasion of the adjacent tires at a time of transport, which leads to a need of attaching a protection tape over the white rubber at a time of delivery. There also is a

problem that since a white rubber is used, a rubber in other colors cannot be used, which put a limit to a highly fashionable ornament.

(0004)

The present invention, to solve the aforementioned problems, attempts to present a pneumatic tire, for which an ornament in various colors can be applied by a simple method and an ornamenting means applicable to high-performance tire can be used.

(0005)

The present invention, to achieve the aforementioned objective, attempts to present a pneumatic tire comprising a annular tread, a pair of sidewalls extending from both ends of tread in the radial direction, and a bead section formed on the inner edge of each sidewall in the radial direction. In this tire, an annular groove is made at a proper spot of the sidewall concentrically with tire. The bottom surface of the groove is made flat and a heat-resistant and rain-proof sticker, which is not easily peeled off, is attached to the bottom surface. So, by a simple structure, the ornament using various colors can be applied and this ornament can also be applied to high-performance tire.

(0006)

(Embodiment Example)

The embodiment of the present invention is explained below with reference to the drawings. In Fig. 1, the tire T is equipped with the annular tread 1, a pair of sidewalls extending from both edges of tread 1, the bead section 3 at the inner edge of each sidewall 2 in the radial direction, and with the annular bead core 4 imbedded in the bead section 3.

(0007)

As shown in Fig. 2, at the proper place on the sidewall 2, the annular groove 5 is made concentrically with the tire T. As shown in Fig. 3, the bottom surface 51 of groove 5 is made planar, more preferably, it is formed to become planar at a time of filling the air. Both sidewalls 52 and 52 are projected from the outer surface of sidewall 2 toward the outside of the tire to form a pair of protectors 6 and 6. Then, the heat-resistant and rain-resistant sticker 7, which is not easily peeled off, is bonded to the inside of the aforementioned groove 5 (Fig. 1 and Fig. 3).

(0008)

According to the aforementioned structure, manufacturing is easy since the groove 5 is only made in the sidewall 2. Not only a new equipment is not necessary, but also the protection tape is not necessary at the time of

delivery since the sticker 7 can be bonded at any desired time (e.g., at the time of tire mounting). When the sticker 7 is destroyed or contaminated, it can be easily replaced. Since its durability is not an issue, the sticker can be applied to high-performance tire. Since the color and design of the sticker 7 can be freely selected, the tire can be colorful while simultaneously coordinating with the design of wheel, enhancing the fashion of a vehicle. Moreover, by installation of the annular protectors 6, the sticker will not be damaged even when the sidewall 2 contacts with the sidewalk of the road.

(0009)

(Advantage)

The present invention, for its having the aforementioned structure, produces the following advantages. Since a groove is only made in the sidewall of a tire, its manufacturing is easy without requiring a new equipment. Also, since the sticker can be bonded at a desired time, the protection tape is not needed when delivered. Since the sticker can be easily replaced when destroyed or contaminated and needs not be durable, it can be applied to a high-performance tire. Since the color and design of the sticker can be properly selected according to the user's preference, the tire can be colorful while coordinating with the wheel design, which enhances the fashion of a vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a sectional view of the tire as the embodiment example of the present invention. Fig. 2 shows a side view of the tire as the embodiment example of the present invention. Fig. 3 shows a cut-away view of the tire as the embodiment example of the present invention.

T: tire

1: tread

2: sidewall

3: bead section

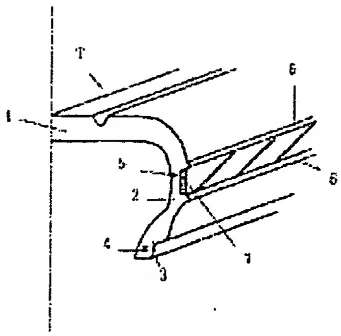
4: bead core

5: annular groove

6: protector

7: sticker

【図1】



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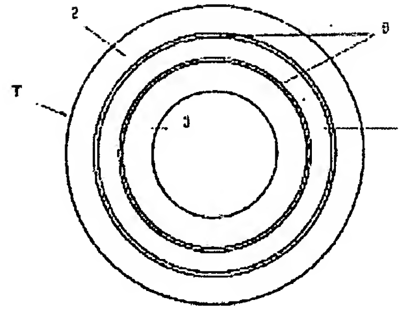

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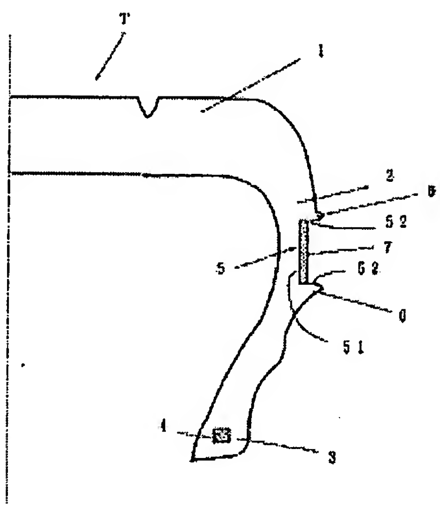

Translations
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APPENDIX TO EXAMINER'S ANSWER

[PTO 2007 1020]

Japanese Patent

(Number of Document 11-059135)

[Pneumatic tire]

Author (I. Miyazaki)

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(54). [Title of the invention]

Pneumatic tire

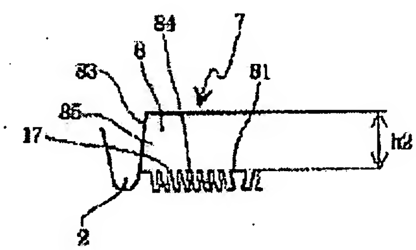
(57). [Abstract]

[Topic]

While running, the stone get caught into the secondary grooves that open or do not open into the main grooves in the circumferential direction of the tire tread part and this stone can be easily discharged outside.

[Solution means]

The lateral grooves 6, 8 that are the secondary grooves that open into the main grooves in the circumferential direction 2, 3, 4 are provided on tire tread part 1, multiple transporting protrusions 17 that are saw teeth shaped in its cross section are formed on the grooves bottom part 84 of lateral grooves 6, 8 that



are above described secondary grooves.

[Scope of the patent claims]

[Claim item 1]

Regarding the pneumatic tire equipped with the main grooves in the circumferential direction and the secondary grooves that open or do not open into said main grooves in the circumferential

direction in the tire tread part, the pneumatic tire is characterized such that multiple transporting protrusions that are saw shaped in its cross section are formed at the grooves bottom part or the grooves wall part of the above described secondary groove.

[Claim item 2]

It is the pneumatic tire described in the claim item 1 wherein the transporting protrusions comprise, in cross sectional shapes, the top part that comprises the grooves bottom part of the secondary groove, two wall surface parts that extend from the both sides of the top part to the base part and constitutes the wall surface of the teeth of the saw teeth, and the base part that constitutes the root of the protrusions, and above described two wall surface parts are inclined on the same sides vis-à-vis the normal line that goes from the top part to the base part direction.

[Claim item 3]

The pneumatic tire described in the claim item 1 or 2 wherein the cross section widths of the grooves are equipped with the secondary grooves that gradually expand and the transporting protrusions are inclined in the direction in which the cross section width of the grooves expands.

[Claim item 4]

The pneumatic tire described in the claim item 3 wherein the transporting protrusions are inclined from the secondary grooves

with a narrow width of the cross section of the grooves to the secondary grooves or main grooves with wide width of the cross section of the grooves or in the circumferential direction.

[Detailed explanation of the invention]

[0001]

[Utilized field in industry]

Regarding the pneumatic tire, the present invention relates to improving the prevention of the stone catching by the secondary grooves formed on the surface of particularly its tire tread part.

[0002]

[Prior arts]

Traditionally, said inventor proposed the technique wherein regarding the tires, particularly, truck/ bus tires, while running, the grooves formed on the tire tread part surface bite into the stones from the road, the caught stone are removed from the grooves. (Japan Patent Disclosure Hei5-85110)

[0003]

That is, Japan Patent Disclosure Hei5-85110 offers the technique wherein at the grooves bottom part of the grooves, a cype is formed that inclines in the direction of the deep grooves that have a large cross section area. Hence, by forming this inclined cype, grooves bottom part is parted, hence, by the ground contacting pressure that pushes the caught stone in, this grooves bottom part is deformed in the forward tilting state as though collapsing

forward, the caught stone is discharged.

[0004]

[Problems the present invention attempts to solve]

However, the secondary grooves that open or do not open in the main grooves in the circumferential direction of the tire tread part is structured such that it is different from the main grooves in the circumferential direction with large grooves width, has narrow grooves width, and particularly, in case the secondary grooves is positioned in the tire width direction, responding to the rotation of the tire, the land part themselves of the adjacent tire tread part that sandwiches grooves receive the action of the ground contacting pressure from the road surface and said grooves are likely to catch the stone.

[0005]

Hence, even the tire with above described cype formed at the grooves bottom part of the grooves can discharge the stone; furthermore, the structure is preferred wherein the caught stone can be discharged for the secondary grooves.

[0006]

The topic of the present invention is to provide the pneumatic tire whereby, while running, the stone can be easily discharged outside that got caught into the secondary grooves that open or do not open into the main grooves in the circumferential direction of the tire tread part.

[0007]

[Means to solve the problems]

In order to attain the above described topics, the inventors studied very hard, consequently, the present invention adopted the structure wherein, regarding the pneumatic tire equipped with the main grooves in the circumferential direction and the secondary grooves that open or do not open into said main grooves in the circumferential direction in the tire tread part, the pneumatic tire is such that multiple transporting protrusions that are saw shaped in its cross section are formed at the grooves bottom part or the grooves wall part of the above described secondary groove.

[0008]

Hence, in case of the pneumatic tire of thins invention wherein multiple transporting protrusions that are saw teeth shaped in cross section are formed at the groove bottom part or the groove wall part of the secondary grooves, when contacting the ground, the caught stone, while the grooves wall part of both sides of secondary grooves are being pushed into the secondary groove, is pushed to the grooves bottom part by the vertical direction force from the road surface vis-à-vis the tire, and is sandwiched into the grooves wall part by the deformation of the tread rubber by the same vertical direction force. The stone that was pushed to this grooves bottom part and the grooves wall part, furthermore while collapsing the saw teeth shaped transporting protrusions

furthermore, moves into the secondary grooves, consequently, as the top of the transporting protrusions that collapsed moves, the caught stone moves to the collapsed side.

And, due to the rotation of the tire, when it attains non ground contacting state, that is, when it gets separated from the ground, above described vertical direction force and compression force vis-à-vis the caught stone in the grooves is released, and also, the centrifugal force by the rotation of the tire works, consequently, collapsed transporting protrusions attempts to be restored to the original position, however, the working in the length direction of the grooves is controlled as the said transporting protrusions is inclined in one direction and also due to the friction force from the grooves wall of the grooves pushed wide. Because of this, it is difficult for the caught stone to return to the original position. Hence, when it contacts the ground next time, this caught stone, while collapsing the next transporting protrusion, moves into the secondary groove, and moves to the collapsed side accompanied by the move of the top of the collapsed transporting protrusion. Every time the tire rotates, this move is repeated, consequently, the caught stone in the grooves keeps moving to the secondary grooves with wide grooves width or to the main grooves in the circumferential direction. And, regarding the secondary grooves with wide grooves

width or the main grooves in the circumferential direction, the force of the constraint that was acting on such stone is gone, and is discharged outside of the tire from the grooves by gravity or the centrifugal force.

[0009]

And, [secondary groove] in the present invention means the grooves other than the main grooves in the circumferential direction connected continuously in the circumferential direction in the tire tread part. Hence, in addition to the lateral grooves and the like that opens in this main grooves in the circumferential direction and extends in the tire width direction, it includes the grooves that do not open in to the main grooves in the circumferential direction. Hence, it includes for instance, the secondary grooves that open vis-à-vis the primary grooves that opens in the main grooves in the circumferential direction and the like. And from the relationship between grooves width and grooves depth, it includes the fine grooves and notched grooves such as cype, and slit and the like that have narrow groove width. In a nut shell, it includes all the grooves that cause stone catching other than main grooves in the circumferential direction.

[0010]

[Embodied configuration of the invention]

Figure 1 is a brief flat surface drawing showing the tread pattern of embodied configuration of the pneumatic tire of the present

invention. Figure 2 is a brief half cross section drawing along X-X line of the pneumatic tire in figure 1. Figure 3 is a brief cross section drawing of the main part of the grooves bottom part of the lateral grooves of the same tire in figure 3. Figure 4 is a brief cross section drawing showing the stone catching state in the lateral grooves of the same tire. Figure 4 (A) is a drawing showing the stone catching state when it contacts the ground, figure 4(B) is a drawing showing the stone catching state when it separates from the ground, and figure 4 (C) is a drawing showing the stone catching state when it contacts the ground next time.

[0011]

In figure 1, 1 is a tire tread part, 2 is the zig zag shaped main grooves in the circumferential direction provided at the tire center area of tire tread part, 3, 4 are the approximately straight main grooves in the circumferential direction 2 provided in the tire shoulder side area of the tire tread part.

[0012]

5 is a block provided between the main grooves in the circumferential direction 2 and approximately straight grooves in the circumferential direction 3, and is blocked by the lateral grooves 6 which is the secondary grooves which is bent approximately V letter shaped in the tire width direction and is

blocked by the lateral grooves 6 and likewise. And likewise, 7 is a block provided between the zig zag shaped main grooves in the circumferential direction 2 and approximately straight grooves in the circumferential direction 3, and is blocked by lateral grooves 8 which is bent approximately reverse V letter shaped in the tire width direction.

[0013]

Regarding lateral grooves 6, 8, as shown in the figure, as far as either of center part 61, 81, its groove width is the narrowest, and as far as the opening edge 62, 83 that open into the main grooves in the circumferential direction 2, the groove width is the widest.

[0014]

And in figure 1, 9 and 10 are the cype formed in the tire width direction on the block 5, 7 surfaces. Cype 9 is the one end open-another end close type cype wherein it is notched from the grooves in the circumferential direction 2, somewhat parallel with the lateral grooves 6 that is bent in an approximately V letter shape, and the center part of the block 5 is extended in the tire width direction. Cype 10 is the one end open- another end close type cype wherein it is notched from the grooves in the circumferential direction 2, somewhat parallel with the lateral grooves 8 that is bent in an approximately V letter shape, and the center part of the block 5 is extended in the tire width direction.

[0015]

11, 12 are the shoulder rib that constitutes the tire shoulder area respectively. In shoulder rib 11 is, as shown in the figure, is provided lateral grooves 13 in the tire circumference direction with intervals repeatedly wherein this lateral groves 13 extends in the tire width direction in the form that somewhat continues to the aforementioned lateral grooves 6 by sandwiching main grooves in the circumferential direction 3. And, between this lateral grooves 13, 13, cype 14 that extends in the tire width direction is provided repeatedly with intervals in the tire circumference direction same as lateral grooves 13. In shoulder rib 12 is, as shown in the figure, the lateral grooves 15 is provided in the tire circumference direction with intervals repeatedly wherein this lateral grooves 15 extend in the tire width direction in the form that somewhat continues to the aforementioned lateral grooves 8 by sandwiching main grooves in the circumferential direction 4 And between this lateral grooves 15, 15 is provided this cype that extends in the tire width direction with intervals in the tire width direction repeatedly same as lateral grooves 15.

[0016]

In figure 1 and figure 2, 84 is the grooves bottom part of lateral grooves 8 which is a secondary grooves, and 85 is the grooves wall part of the same lateral grooves 8. On the grooves bottom part 84 of lateral grooves 8 is formed transporting protrusions 17 to transport the caught stone and discharge it. Transporting protrusions

17 is saw teeth shaped in cross section, and as shown in figure 3, in cross section shape, comprises top part 171 that makes grooves bottom part 84 of the lateral grooves which is a secondary groove, and two wall surface part 173, 174 that constitute the wall surface of the teeth of the saw teeth that extends in the direction of the base part 17 from both sides of top part 171, and base part 172 that constitutes the base root of the protrusions, and above described two wall surface parts are inclined on the same side vis-à-vis the normal line N that descends from top part 17 to the base part 172 direction. The transporting protrusions of this embodied configuration forms a triangle shape with unequal sides of the [illeg] that approximate approximately trapezoid. And, regarding the transporting protrusions of the present invention, not only above described wall surface part,173, 174 but also grooves wall part 85 side of lateral grooves 8 are not formed by being integrated into same grooves wall part 85 continuously, hence, the structure is such that in response to the stone catching, it is easily collapsed independently. However, the transporting protrusions of the present invention can be structured such that grooves wall part 85 sides of lateral grooves 8 can be formed integrated into the same grooves wall part 85 continuously. However, as the structure where push collapsing is easy responding to the stone catching, at least, the structure is desired such that the top part of the transporting protrusions is independent from grooves wall part 85 of lateral

grooves 8 and non continuous.

[0017]

And, transporting protrusions 17 is inclined in the direction where cross section width of lateral grooves 8 expands. Hence, as shown in figure 2, using the center part 81 of lateral grooves 8 as the boundary, at the direction where the top part 171 of transporting protrusions 17 goes to opening part 82, 83, each is inclined in the opposite direction.

[0018]

And, regarding the tire of this embodied configuration, same transporting protrusions 18 is formed on lateral grooves 6 , and same as lateral grooves 8, using the center part 61 of lateral grooves 6 as the boundary, at the direction where the top part of transporting protrusions 18 goes to opening edge 62, 83, each is inclined in the opposite direction.

[0019]

Hence, as shown in figure 4 (A), stone 19 pushes and widens the grooves wall part 85 of both sides inside lateral grooves 8 which is the secondary grooves and gets caught, and this caught stone 19 is pushed against the grooves bottom part 84 by the vertical direction force 20 from the road surface against the tire shown by the arrow when contacting the ground, and is sandwiched into the grooves wall part 85 by the deformation reaction force of the grooves 8 that was pushed and widened. The stone 19 that is pushed against this grooves bottom

part 84 and grooves wall part 85, furthermore while pushing and collapsing saw teeth shaped transporting protrusions 17, moves into lateral grooves 8, consequently, as the top part 171 of push collapsed transporting protrusions 17 moves, caught stone 19 moves to the collapsed side.

[0020]

Next, by the rotation of the tires, when the time arrives at the non contacting state, that is, separates from the ground, vertical direction force 20 and compression force vis-à-vis the caught stone 19 is released, and since the centrifugal force by the tire rotation works, consequently, as shown in figure 4 (B), collapsed transporting protrusions 17 tries to be restored to the original position, however, since the said transporting protrusions 17 is inclined in one direction, and due to the friction force from the grooves wall part 85 of the push widened grooves, the move in the length direction of lateral grooves 8 is suppressed. Hence, it is difficult for caught stone 19 to return to the original position.

[0021]

Hence, as shown in figure 4(c), when it contacts the ground, again, this caught stone 19, while pushing and collapsing the transporting protrusions 17, moves inside of lateral grooves 8, and accompanied by the move of top part 171 of push collapsed transporting protrusions 17, further moves to the push collapsed side.

[0022]

As described above, this move is repeated for each tire rotation, consequently, caught stone 19 in the grooves moves to the main grooves in the circumferential direction 2. And, in main grooves in the circumferential direction 2, the force of constraint that was acting on such stone 19 is gone, is discharged outside of the tire from main grooves in the circumferential direction 2 either by gravity or centrifugal force.

[0023]

It goes without saying that regarding this discharge mechanism, the main grooves in the circumferential direction to be discharged is different depending on the incline direction of the transporting protrusions formed in the lateral grooves which is the secondary grooves.

[0024]

The transporting protrusions of the above described embodied configuration was formed at the groove bottom part, however, it can be formed at the grooves wall part, it will have the same effects, And, it can be formed on both of grooves bottom part and grooves wall part.

[0025]

Furthermore, the transporting protrusions of above described embodied configuration was structured to incline in the direction of main grooves in the circumferential direction, however, in case a tire is equipped with different tread time than above described

tire, for instance, the incline direction of the transporting protrusions can be adopted such that, for instance, the cross section width of the grooves goes from the secondary grooves with a narrow width of the cross section to the secondary grooves with wider width of the cross section of the grooves.

[0026]

The eight h1 of the transporting protrusions as shown in figure 3 is not particularly limited, however, as shown in figure 2, it is sufficiently executable if it is 0.1 ~ 0.3 times of the maximum depth h2 of the lateral grooves 8 which is the secondary grooves where transporting protrusions are formed.

[0027]

And, the pitch P between the top part - top part of the transporting protrusions as shown in figure 2 is not particularly limited, it is sufficiently executable if it is 0.1 ~ 0.3 times of the maximum depth of the secondary grooves.

[0028]

And in order to form the transporting protrusions in the secondary groove, saw teeth shaped braids are provided inside the surface of mold that molds the tread pattern, thus attaining it. Grooves bottom part and grooves wall part of the secondary grooves of the mold tire can be subjected to the cut processing, thus obtaining the transporting protrusions. The production method is not particularly restricted.

[0029]

[Embodied examples]

The samples of tire with the tire size 285/75 R24.5 with the structure as shown in figure 1 are made, is mounted into the back wheels of the transporting truck, and after running 100,000 miles, the total number of actual stone catching and stone catching scar (one where stones went deep into the grooves and left scars) were counted. For comparison, other than that the transporting protrusions was not equipped in the grooves, samples of comparison example tire 1 with the same structure, and instead of the transporting protrusions, samples of comparison example tire 2 with the cype formed at the same location were made respectively, above described stone catching same as above described embodied example tire were evaluated. Table 1 shows its result. Regarding the evaluation of the stone catching, Index is displayed using the above described total number of comparison example 1 tire as 100. It shows that the smaller the value, the better the prevention of the stone catching.

[0030]

[Table 1]

	Embodied example 1	Comparison example 1	Comparison example 2
Stone catching index	8	100	15

[0031]

According to the table 1, it is recognized that the embodied example

tire with multiple transporting protrusions formed at the grooves bottom part of the secondary grooves obtained the good stone catching preventive effect. And it obtained the better stone catching preventing effect than the comparison example 2 tire with cype formed at the grooves bottom part of the secondary groove

[0032]

[Effects of the invention]

As described above, regarding the present invention, this is the pneumatic tire wherein multiple saw teeth shaped transporting protrusions in cross section are formed in the grooves bottom part or grooves wall part of the secondary grooves of tire tread part 1, hence, while running, the caught stone in the secondary grooves can be discharged outside easily.

[0033]

And, the tire of the present invention is structured such that at the groove bottom part or the groove wall part of the secondary grooves, multiple saw teeth shaped transporting protrusions in cross section are formed, hence, there is no element to narrow the cross section size of the grooves of the secondary groove, hence, it do not interfere with the basic tire performance such as drainage or operating safety and the like.

[Simple explanation of the drawings]

Figure 1 is a brief flat surface drawing showing the tread pattern of embodied configuration of the pneumatic tire of the present

invention.

Figure 2 is a brief half cross section drawing along X-X line of the pneumatic tire in figure 1.

Figure 3 is a brief cross section drawing of the main part of the grooves bottom part of the lateral grooves of the same time in figure 3.

Figure 4 is a brief cross section drawing showing the stone catching state in the lateral grooves of the same tire.

Figure 4 (A) is a drawing showing the stone catching when it contacts the ground, figure 4(B) is a drawing showing the stone catching state when it separates from the ground, and figure 4 (C) is a drawing showing the stone catching state when it contacts the ground next time.

[Explanation of the symbols]

1... tire tread part

2... main grooves in the circumferential direction

3... main grooves in the circumferential direction

4... main grooves in the circumferential direction

6... lateral grooves (secondary grooves)

8... lateral grooves (secondary grooves)

84... grooves bottom part

85... grooves wall part

17... transporting protrusions

171... top part

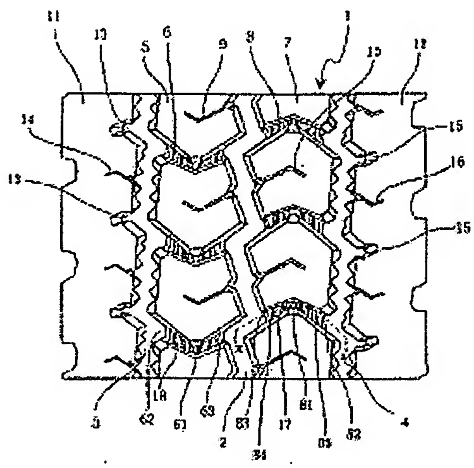
172... base part

173... wall surface part

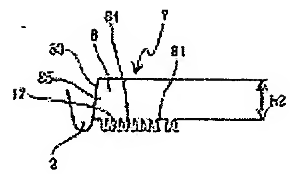
174... wall surface part

18... transporting protrusion

【図1】



【図2】



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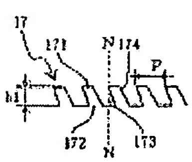

【図4】